

# **AIR FORCE QUALIFICATION TRAINING PACKAGE (AFQTP)**



for  
**STRUCTURAL**  
**(3E3X1)**

**MODULE 37**

**AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES**

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Career Field Education and Training Plan (CFETP) references from 1 Apr 97 version.
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OPR: HQ AFCEA/CEOT  
(SMSgt Michael R. Shakal)

Certified by: HQ AFCEA/CEO  
(Colonel Lance C. Brendel)

**Notice.** This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

# AIR FORCE QUALIFICATION TRAINING PACKAGES

## for STRUCTURAL (3E3X1)

### INTRODUCTION

*Before starting this AFQTP*, refer to and read the “Trainee/Trainer Guide” located on the AFCEA Web site <http://www.afcesa.af.mil/>

*AFQTPs are mandatory and must be completed* to fulfill task knowledge requirements on core and diamond tasks for upgrade training. *It is important for the trainer and trainee to understand* that an AFQTP does not replace hands-on training, nor will completion of an AFQTP meet the requirement for core task certification. AFQTPs will be used in conjunction with applicable technical references and hands-on training.

*AFQTPs and Certification and Testing (CerTest) must be used as minimum upgrade requirements for Diamond tasks.*

### MANDATORY minimum upgrade requirements:

***Core task:***

AFQTP completion  
Hands-on certification

***Diamond task:***

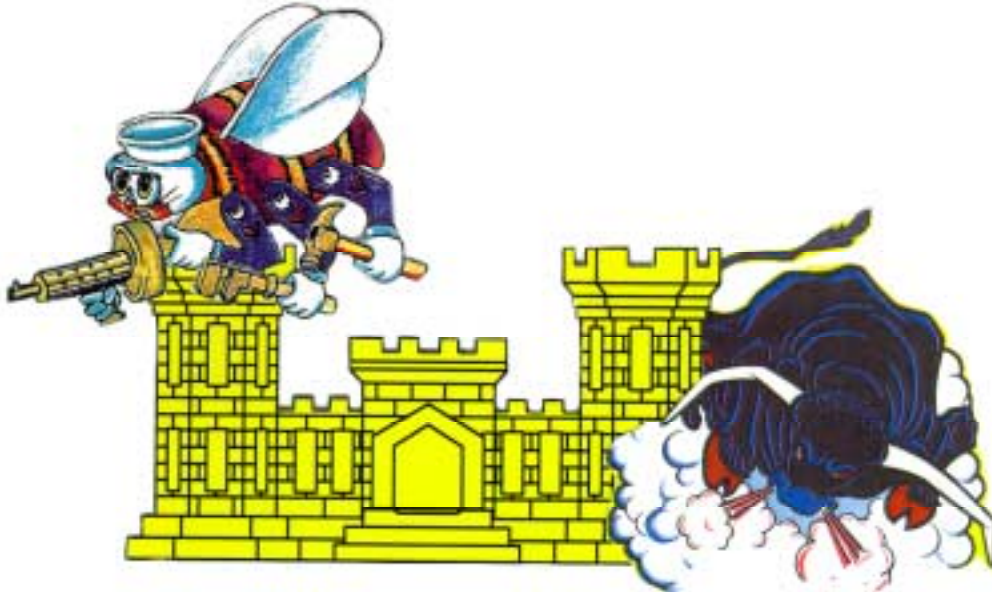
AFQTP completion  
CerTest completion (80% minimum to pass)

**Note:** *Trainees will receive hands-on certification training for Diamond Tasks when equipment becomes available either at home station or at a TDY location.*

***Put this package to use.*** Subject matter experts under the direction and guidance of HQ AFCEA/CEOT revised this AFQTP. If you have any recommendations for improving this document, please contact the Structures Career Field Manager at the address below.

HQ AFCEA/CEOT  
139 Barnes Dr. Suite 1  
Tyndall AFB, FL 32403-5319  
DSN: 523-6421, Comm: (850) 283-6421  
Fax: DSN 523-6488  
E-mail: [ceott.helpdesk@afcesa.af.mil](mailto:ceott.helpdesk@afcesa.af.mil)

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## EXPEDIENT REPAIR AND DESTRUCTION

MODULE 37

AFQTP UNIT 1

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### ROOF REPAIRS (37.1.1.4.1.)

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## ROOF REPAIRS

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	37.1.1.4.1. Roof repairs
<b>Training References:</b>	<ul style="list-style-type: none"><li>• CDCs 3E351</li></ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"><li>• Possess as a minimum, a3E331 AFSC.</li><li>• Study CDC 3E351C Vol. 4</li></ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"><li>• Drill</li><li>• Apex</li><li>• Handsaw</li><li>• Hammer</li><li>• Nails</li><li>• Screws</li></ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"><li>• The trainee should know how to perform expedient repairs to roofs</li></ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"><li>• The trainee should be able to describe how to perform various types of simulated expedient roof repair with no trainer assistance</li></ul>
<b>Notes:</b>	
<ul style="list-style-type: none"><li>• Any safety violation is an automatic failure.</li></ul>	

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## ROOF REPAIRS

**Background:** During a war or contingency operation, it is CE's responsibility to keep facilities as usable as possible. This task involves not only assessing the damage but also restoring facilities to operational condition.

In conjunction with restoring major utilities to the base, it's important to repair structural damage to facilities so operational functions can be resumed without danger to building occupants. The types of structural damage that may be encountered range from minor too extensive. A tornado or enemy attack may demolish numerous buildings or heavily damage sections of a facility. An earthquake, depending on its severity, could collapse a structure or only crack the plaster in a few rooms. In any of these cases, the major emphasis in the period immediately after the damage is on rapid restoration of vital base facilities rather than permanent damage repair. As we said, damage assessment teams are the BCE's "eyes".

Safety is an important consideration in any type of repair, but it is especially important in expedient repairs after an emergency. The very nature of the post-disaster or post attack environment makes repair activity inherently dangerous. Live electrical wires may be down, explosive gas vapors may be present, chemical, biological, or nuclear contamination may be prevalent, unexploded ordnance may litter the base, and structures may be weakened. Repair crews and building safety are important considerations in making expedient structural repairs. Never enter a facility unless you are sure there is no immediate danger of collapse. Take a few moments to make a preliminary survey before you try to make any repairs to a building. Base medical facilities will probably be crowded with casualties and civil engineering manpower will be at critical levels. Do not tax these resources even further by causing more injuries through neglect of safety practices. It's every repair crewmembers responsibility to handle recovery tasks with the utmost concern for safety.

*To perform this task, follow these steps:*

**Step 1: Ensure building is safe to enter.**

**Step 2: Make notes were the damage is done to the roof.**

- Severe damage may require a structural engineer to certify that the roof is safe to walk on.

**Step 3: Before setting up any ladder always check to make sure there are no power lines in the way.**

- Ensure the ladder you are setting up is long enough to extend 36" above the edge of the building.

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- The base of the ladder should be one-fourth of the height away from the building. EXAMPLE: The height of the building from the ground to the edge of the roof is 12' so the base of the ladder needs to be 4' away from the side of the building.
- If the roof had a 2' over hang, then the ladder needs to be 6' away.

**Step 4: While walking around on the roof, always be careful where you step.**

- The building could have had an internal explosion and weaken the roof from the under side.
- Look for any damage; it could be anything from a hole the size of a softball to something you could land a helicopter in.

**Step 5: It's time to do an expedient repair and write a material list.**

- If the hole is from 3" to 3' a single piece of 3/4" plywood will do, along with some plastic roof cement and screws.
- Screws should be long enough to go through the plywood past the roofing material and into the roof decking.

**Step 6: If the hole in the roof is serrated. Trim back the damaged portion to make it smooth.**

**Step 7: Cut the plywood at least 12" bigger than the roof opening.**

- Apply a liberal amount of plastic cement around the hole.
- Place the plywood over the hole and secure it with the screws. You should see the roofing cement squeeze out from underneath the plywood upon tightening the screws.
- Keep in mind that this is just a temporary repair.

**Step 8: When the damage is beyond a 3' diameter hole, you will have to use 2"x4" or larger materials to cover the hole.**

- EXAMPLE: The hole in the roof this time is 12' in diameter. Stretching plastic or a tarp over the hole and securing it to the roof deck would work temporarily.
- But if it started to rain the water may pond on the tarp/plastic and tear it. Go inside the building and brace any damaged trusses or beams that may be unsupported due to the damaged roof.
- You can use 2x4s or 4x4 material and cut them to the proper length. You can also use small hydraulic jacks to push them back into place.
- Take 2 x 4 x 16's and lay them on edge across the hole about 24" on center.
- Nail a single top plate and a bottom plate on it.
- Lay plywood across your 2 x 4s just like you would when decking the roof.
- Apply a liberal amount of plastic roof cement around the perimeter 2x4s and toenail it to the roof decking.

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- Cover the plywood with felt, plastic, tarp, or anything else that would make it water-resistant.
- Now you have a temporary repair that would be water-resistant and should not collapse under pressure.

**Step 9: When the damage to the roof is beyond 12' in diameter you can repair it the same way you did in step 8.**

- You might have to install some additional supports under the patch to carry the extra weight.

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**Review Questions  
for  
Roof Repairs**

<b>Question</b>	<b>Answer</b>
1. A sheet of plywood should cover a hole from _____.	a. 3” to 8’ in diameter b. 8’ to 12’ in diameter c. 3” to 3’ in diameter d. 3’ to 12’ in diameter
2. How long should expedient repairs last?	a. As long as the existing roof b. Until it stops raining c. Until permanent repairs can be made d. All the above
3. What is the most important step before doing any roof repair?	a. Ensure the roof is structurally safe to walk on b. Ensure all downed power lines have been repaired c. The building is a priority d. All The Above
4. You should repair a roof during a thunderstorm.	a. True b. False

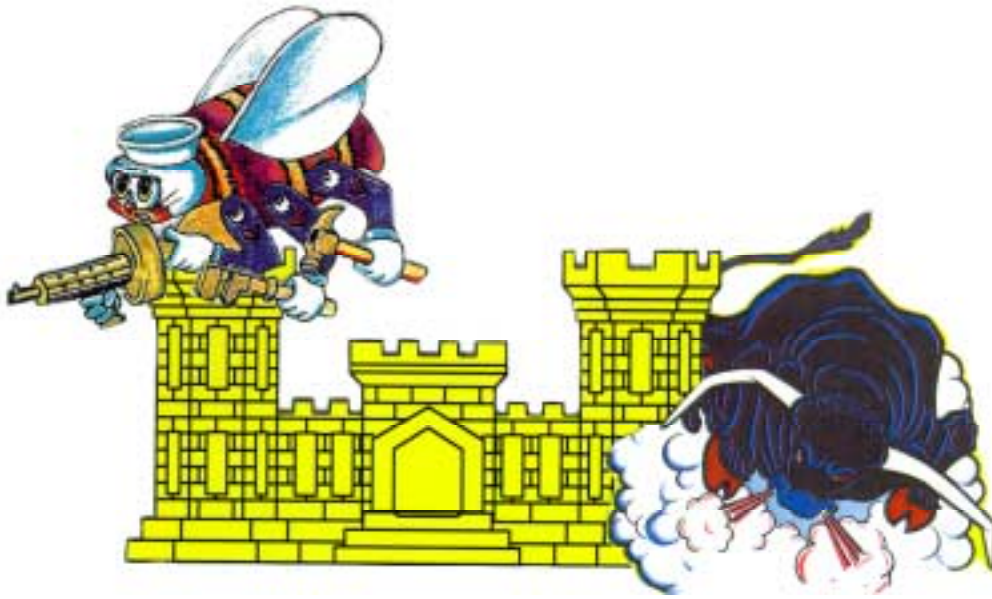
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## ROOF REPAIRS

Performance Checklist		
Step	Yes	No
1. Did the trainee understand what a temporary repair is?		
2. Did the trainee know how to repair a damaged roof?		
3. Does the trainee understand how to brace a sagging roof?		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will ensure the issue is still fresh in the mind of both the trainee and trainer.

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## EXPEDIENT REPAIR AND DESTRUCTION

MODULE 37

AFQTP UNIT 1

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### EXTERIOR WALLS (37.1.1.4.2.)

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## EXTERIOR WALLS

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	37.1.1.4.2. Exterior walls
<b>Training References:</b>	<ul style="list-style-type: none"><li>• CDCs 3E351</li></ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"><li>• Possess as a minimum, a 3E331 AFSC.</li><li>• Study CDC 3E351C Vol. 4</li></ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"><li>• Drill with Apex</li><li>• Circular Saw</li><li>• Handsaw</li><li>• Hammers</li><li>• Powder Actuated Gun</li><li>• Sledge hammers</li><li>• Screws and nails</li></ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"><li>• The trainee should know how to perform expedient repairs to walls</li></ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"><li>• The trainee should be able to describe how to perform various types of simulated expedient wall repairs with no trainer assistance</li></ul>
<b>Notes:</b>	
<ul style="list-style-type: none"><li>• Any safety violation is an automatic failure.</li></ul>	

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## EXTERIOR WALLS

**Background:** All structural repair efforts should be geared toward making a building safe for occupancy and providing minimal protection from the elements to persons using the facility. The air base is operating under emergency conditions, and people must make allowances for reduced comfort levels. For example, it would be poor resource management to allocate time to repair building air-conditioning unless normal operations would be impossible without cooling.

- **Shoring and buttressing:**

The first concern in structural repairs should be shoring and buttressing any weakened areas to restore a minimum degree of structural integrity to the facility. Use whatever materials are available for shoring. If you can't find readily available sources of material, improvise with whatever is available. Mounds of earth or sandbags can be used for support, depending on the load. Beams may be salvaged from nearby damaged buildings, 2 x 4s may be nailed or tied together to form a larger supporting beam, or timbers cut from fallen trees may be used to prop up weakened areas of the structure.

The first item on your list should be to assess the damaged building. It might be something as simple as a small hole in the side of a wall or the entire corner could have been blown out with the ceiling sagging down. We will discuss it one step at a time and start off with the small damage and work our way up to the extensive damage.

- **Small damage expedient repairs:**

Small damage can be anything from a bullet hole to something a 4'x 8' sheet of plywood could cover up. For holes that are 3" in diameter and less take a can of spray foam and fill the hole. For damage that is a little larger, take a piece of plywood or a whole sheet if necessary to cover the hole. Screw the plywood to the outside of the building if possible. If the building is made out of masonry material such as brick, block or prestressed concrete panels, use a Powder actuated gun to fasten the material to the wall. Shoot the material about 6" away from the damaged section, the reason why is you do not want to damage the wall any further and make final repairs more difficult than need be.

- **Extensive damage expedient repairs:**

Extensive damage can be any thing from a 5' hole to the entire side of a building destroyed. After all utilities have been isolated the debris needs to be cleared away, order to assess the damage more thoroughly. If a hole is larger than a sheet of plywood you might have to install some 2x4s to support the ceiling or floor above, also so you can attach the plywood to the damaged area. When the damage is extremely large you may have to bring in some heavy equipment to clear away the debris. If the damage is so severe that expedient repairs would not be prudent, barricade the room or building until proper steps can be taken to remedy the situation.

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**Review Questions  
for  
Exterior Walls**

<b>Question</b>	<b>Answer</b>
1. The best material to use to repair a small diameter hole in a wall would be _____.	a. silicone. b. duck tape. c. spray foam. d. All the above.
2. What is the most important step before doing any type of repair?	a. Ensure the roof is structurally safe to enter the building. b. Ensure all downed power lines have been isolated. c. The building is a priority. d. All The Above.
3. You should always do expedient repairs regardless of the amount of damage done to the building.	a. True. b. False.

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## EXTERIOR WALLS

Performance Checklist		
Step	Yes	No
1. Did the trainee identify possible safety hazards prior to making repairs?		
2. Did the trainee select the proper repair material?		
3. Did the trainee support a damaged wall prior to repair?		
4. Did the trainee identify which utilities to isolate before repairs can begin?		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will assure the issue is still fresh in the mind of both the trainee and trainer.

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## EXPEDIENT REPAIR AND DESTRUCTION

MODULE 37

AFQTP UNIT 1

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### STRUCTURAL SHORING/BRACING CONCEPTS (37.1.2.)

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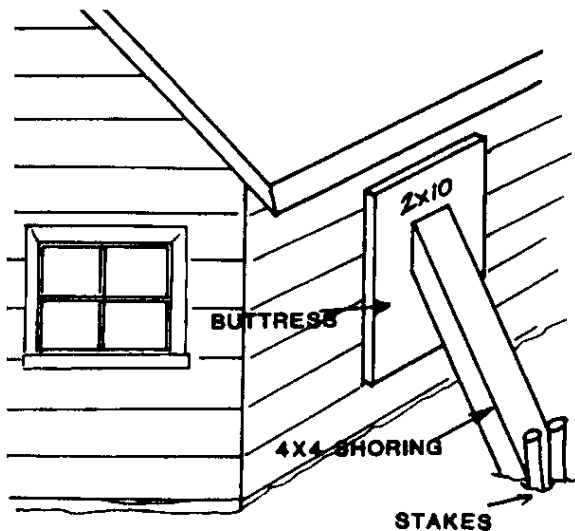
**STRUCTURAL SHORING / BRACING CONCEPTS*****Task Training Guide***

<b>STS Reference Number/Title:</b>	37.1.2. Structural shoring/bracing concepts
<b>Training References:</b>	<ul style="list-style-type: none"> <li>• CDCs 3E351</li> </ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"> <li>• Possess as a minimum, a 3E331 AFSC</li> </ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"> <li>• Circular Saw</li> <li>• Handsaw</li> <li>• Sledge Hammer</li> <li>• Claw Hammers</li> <li>• Screws and nails</li> </ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"> <li>• The trainee should know basic knowledge of structural shoring and bracing concepts</li> </ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"> <li>• The trainee should be able to describe how to perform techniques in structural shoring and bracing concepts</li> </ul>
<b>Notes:</b>	
<ul style="list-style-type: none"> <li>• Any safety violation is an automatic failure.</li> </ul>	

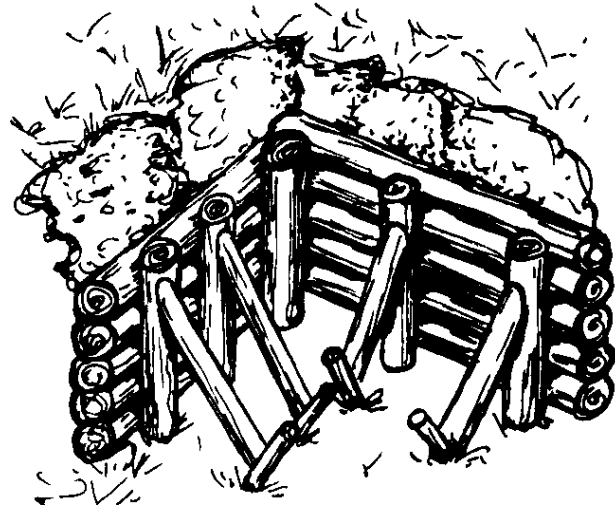
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## STRUCTURAL SHORING / BRACING CONCEPTS

**Background:** The primary purpose of shoring is to restore a minimum degree of structural integrity. This is done by various means. The easiest and least time consuming is to use a beam. A beam placed under or against something as a support device or to stabilize part of the structure is called shoring. Figure 1 depicts how a piece of 2"x 10", a piece of 4"x 4", and some stakes are used as simple shoring. This technique is very sturdy and easy to construct. The disadvantage of this type shoring is that it requires large quantities of new material. Figure 2 shows logs and timbers being used as shoring. Beams may be salvaged from nearby buildings that have been destroyed, while timbers may be cut from downed trees.



**Figure 1, Shoring using a 2x10 and a 4x4.**



**Figure 2, Shoring using logs.**

Another means of bracing that may be used to restore a minimum degree of structural integrity are portable jacks. Portable jacks, however, are used as a last resort, since they may be needed in other locations to serve a more vital role.

Bracing is any device used as a support to resist strain or pressure. Bracing is similar to shoring except that repairs can be completed. Shoring is designed to be left in place for a short period of time. Some items used as bracing are metal beams that are welded into place, 2" X 4" framework, steel cables and turn buckles or quick setting polymer mortar.

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**Review Questions  
for  
Structural Shoring /Bracing Concepts**

Question	Answer
1. What are beams called that are placed under or against something and are used as a support device?	a. Brace. b. Shoring. c. Purling. d. Collar tie.
2. How is bracing different from shoring?	a. Bracing is permanent and shoring is temporary. b. Bracing is temporary and shoring is permanent. c. Shoring requires no skill; bracing requires an engineering degree. d. All the above.
3. Bracing is always a quicker repair then shoring.	a. True. b. False.

**NOTE:**

CerTest number 8077 is mandatory for this task. CerTest number 8077 “Specific Contingency Responsibilities – Structures” include the following diamond tasks:

- Structural shoring/bracing concepts
- Runways
- Tent Hardbacking
- B-1 Revetment

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## STRUCTURAL SHORING AND BRACING CONCEPTS

Performance Checklist		
Step	Yes	No
1. Did the trainee assess safety hazards prior to shoring up wall?		
2. Did the trainee select appropriate brace material?		
3. Did the trainee ensure work needed to be accomplished (was building beyond repair)?		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will assure the issue is still fresh in the mind of both the trainee and trainer.

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## CONDUCT STRIPING PROCEDURES

MODULE 37

AFQTP UNIT 1

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### RUNWAYS (37.1.9.2.1.)

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## RUNWAYS

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	37.1.9.2.1. Runways
<b>Training References:</b>	<ul style="list-style-type: none"><li>• CDCs (3E351).</li><li>• TO 35E2-6-1, MAOS Marking System.</li><li>• CD-ROM, Contingency Airfield Marking Procedures Version 1, 3E3X1-37.1.9 May 99</li></ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"><li>• Possess as a minimum a, 3E331 AFSC.</li></ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"><li>• Chalk board.</li><li>• Scaled down map of airfield.</li></ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"><li>• The trainee should learn basic knowledge in expedient airfield marking using paint.</li></ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"><li>• The trainee should be able to describe how to paint the new lines on the MAOS.</li></ul>

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## RUNWAYS

**Background:** Immediately following an enemy air attack, priority consideration is usually given to expedient reconstruction of the airfield to provide both a defensive and retaliatory capability. However, constraints such as limited time and the extent of damage incurred will normally dictate that a minimum operating strip (MOS) and access routes be established, rather than attempting to repair the entire runway. The launch and recovery surface selected for repair is called the minimum airfield operating surface (MAOS). In short the MAOS is the MOS from which the aircraft take off and land and all the access routes required to get the aircraft from the staging locations to the MOS. To accomplish this recovery, civil engineer forces play a vital role. They are directly involved in consequential actions such as assessing the extent of damage, repairing pavement craters and installing airfield lighting and arresting systems. However once all these functions are completed, a MAOS is still not ready to support the aircraft operations until one of the last initial engineering recovery actions is accomplished - airfield pavement marking. The selected MAOS and taxiways will require layout and marking using a MAOS Marking system (MAOSMS). A MOS will usually be between 50 and 150 feet wide and between 5,000 and 10,000 feet long. Access taxiways will normally be 25 to 50 feet wide and an undetermined length. Without appropriate airfield pavement marking in an exploded and unexploded ordnance laden environment, aircraft movement is hazardous and difficult.

The MOS marking crew consists of at least one engineering journeyman, a structural journeyman, and four assistants of any specialty. The engineering journeyman leads three assistants in laying out the MOS and access taxiways and then placing the remaining elements of the MAOSMS. The structural journeymen and one assistant use the paint striping set to mark the MOS and taxiways and blackout confusing/unnecessary lines on the MOS and taxiways. It is possible that the entire MOS and access taxiway layout cannot be done at the same time because of delays required while EOD personnel clear the area. The crew must coordinate with the Rapid Runway Repair (RRR) Support team chief, to determine layout requirements and priorities. This information is normally decided in the Survival Recovery Center (SRC) and provided to the RRR command element by the Damage Control Center (DCC). The layout precedes pavement repairs. Marking can begin during pavement repairs but most likely won't finish until after pavement repairs are completed.

***To perform the task, view AFQTP 3E3X1-37-1.9. Version 1.0 Contingency Airfield Marking Procedures CD-ROM.***

**NOTE:**

In the CD-ROM there are tests after each section. Complete each section and answer the questions.

CerTest numbers 8091, 8092, 8093, 8094, 8095, 8096, 8097, and 8098 are mandatory for this task.

**HINT:** to increase the chances of obtaining a passing score, recommend you take each corresponding CerTest after you complete a section. Contact your UETM to schedule testing.

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## RUNWAYS

Performance Checklist		
Step	Yes	No
1. Did the trainee select the proper starting point to start painting?		
2. Can the trainee explain the difference between the centerline and the threshold?		
3. Did the state how wide the centerline is?		
4. Did the trainee properly layout the threshold?		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will assure the issue is still fresh in the mind of both the trainee and trainer.

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## PERFORM EXPEDIENT FIELD CONSTRUCTION

MODULE 37

AFQTP UNIT 2

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### TENT HARDBACKING (37.2.1.)

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## TENT HARDBACKING

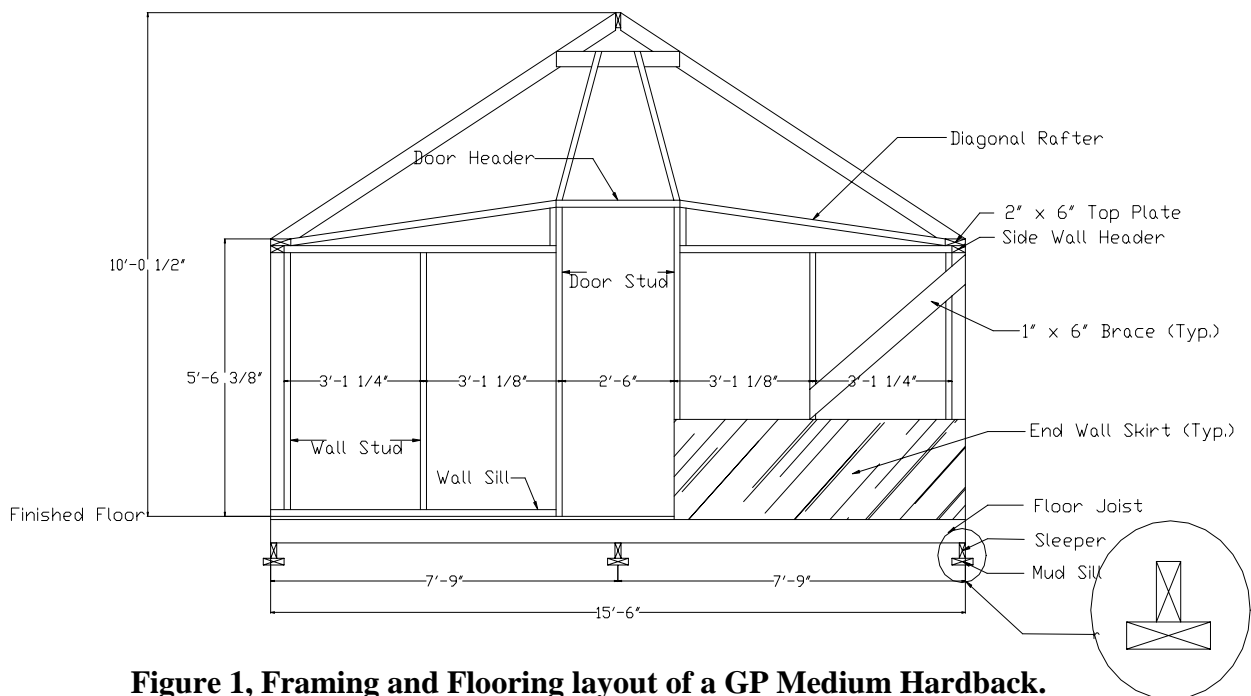
### *Task Training Guide*

<b>STS Reference Number/Title:</b>	37.2.1. Tent hardbacking
<b>Training References:</b>	<ul style="list-style-type: none"><li>• CDCs (3E351).</li><li>• AFPAM 10-219, Vol 5</li></ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"><li>• Possess, as a minimum, a 3E331 AFSC.</li></ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"><li>• Chalk board.</li><li>• 3E3X1 Consolidated Tool Kit (CTK).</li></ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"><li>• The trainee should use basic framing techniques and blue print reading in the construction of a hardback.</li></ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"><li>• The trainee should be able to describe how to construct a hardback.</li></ul>
<b>Notes:</b>	
<ul style="list-style-type: none"><li>• Any safety violation is an automatic failure.</li></ul>	

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## TENT HARDBACKING

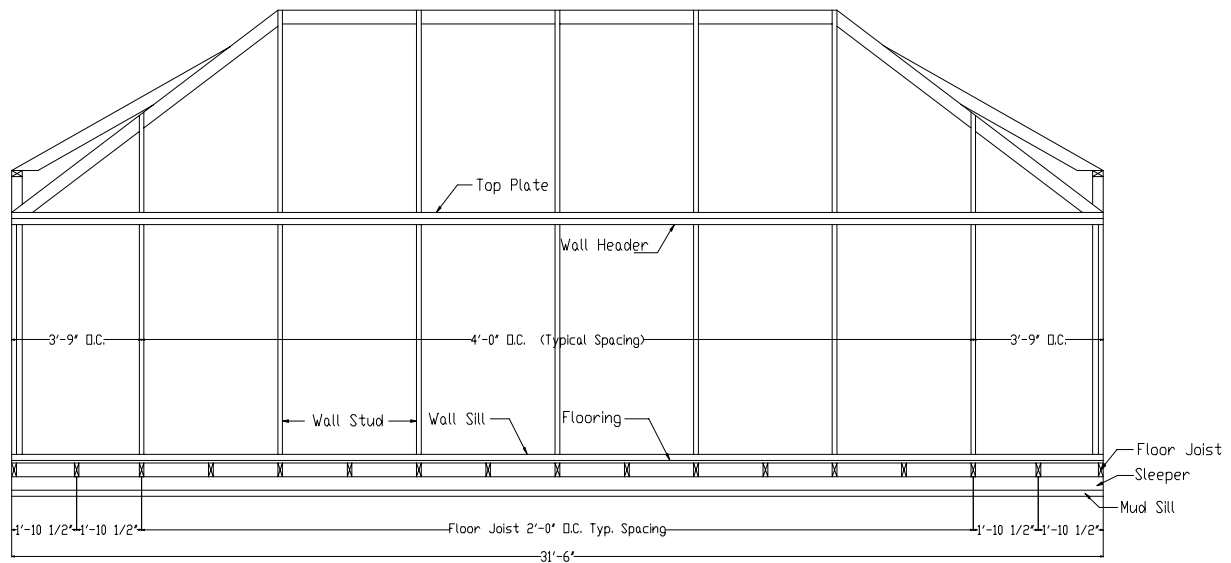
**Background:** Working drawings for framing and flooring of a GP Medium hardback, Figure 1. Tents of this type are used for temporary housing, storage, showers, washrooms, latrines, and utility spaces at an advance base. Keep in mind any time you build a hard back for a tent you should always build the hard back 6" smaller so the tent will fit without being too tight. For example the dimensions for a GP Medium tent is 16'X32' so you would build the hardback 15'6"X31'6".



**Figure 1, Framing and Flooring layout of a GP Medium Hardback.**

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Tent floors consist of floor joists (16' lengths of 2"X4"s) and sheathing (4'X8' sheets of 3/4" plywood). The supports for the floor framing are called mudsills. These mudsills are formed by nailing a 2"X6" to a 2"X4" to form a t-shape. There will be three mudsills that run the full length of the frame, spaced as shown in Figure 1. After the mudsills are assembled lay out the 2"x4" floor joist be sure to follow the plans for the proper spacing. The first two floor joists (at each end) are spaced at 1' 10 1/2". The remaining joists in between (11 each) are on 2' centers. After the floor joist is installed, attach the 3/4" plywood flooring and prepare to build the walls. The wall-framing members are 2"X4" studs. The first stud from each end on the sidewall is

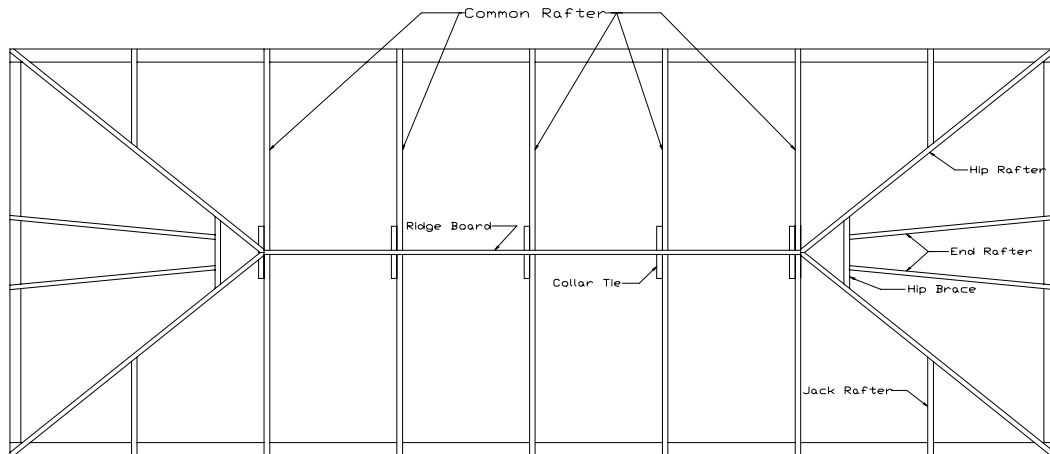


**Figure 2, Framing and floor layout of a GP Medium Hardback.**

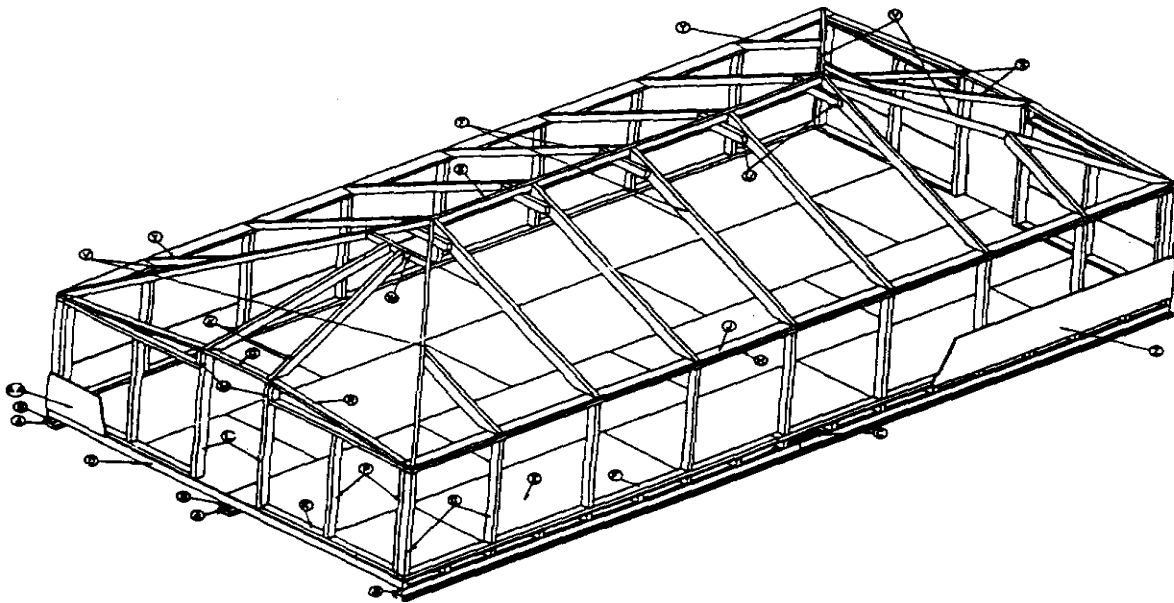
placed 3' 9" from the corner. The rest of the studs are then placed 4' on center. After the walls are laid out and nailed to the top and bottom plates raise each wall into position and secure it to the floor. The end wall is built a little different, so be sure to follow the blue prints for the exact measurements. After all walls are erected, you now can install the 1/2" plywood skirting. Cut the plywood 2' wide then install on all four sides using 8D nails. Be sure all joints fall on a stud.

The next step is to construct the rafter members, Figure 3 and 4. Cut all the common rafters and ridge board. Layout the ridge board on the ground for the common rafters then brace the ridge board in the proper place above the floor and walls. Attach all common rafters and check all measurements. Follow the blue prints and cut the remaining rafter pieces to include collar ties, hip rafter, jack rafters, hips braces, and end rafters.

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**Figure 3, GP Medium Hardback Rafter Layout (top view).**



**Figure 4, Overall view of a GP Medium Hardback Tent.**

The final step in hardbacking a tent is to install insect screen on all walls from the skirting up. Then install a 1"x 6" corner bracing from the top of the skirting to the top corner of the frame. If you are going to be in cold climates you can omit the insect screen and run the skirting all the way up to the top plate. Be sure to follow all plans and double-check the measurements before starting.

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**HARDBACK GP MEDIUM TENT**

<b>Bill of Materials</b>		
DESCRIPTION	NO. REQUIRED	REMARKS
A - 2 x 6 x 16'-0"	3 ea	Mud Sill
2 x 6 x 15'-6"	3 ea	Mud Sill
B - 2 x 4 x 16'-0"	3 ea	Sleeper
2 x 4 x 15'-6"	3 ea	Sleeper
C - 2 x 4 x 2'-0"	3 ea	Splice Board
D - 2 x 4 x 15'-6"	17 ea	Floor Joist
E - 3/4" x 4'-0" x 8'-0"	16 ea	Flooring *1
F - 2 x 4 x 16'-0"	2 ea	Side Wall Sill
2 x 4 x 15'-6"	2 ea	Side Wall Sill
G - 2 x 4 x 5'-1 1/2"	18 ea	Side Wall Stud
H - 2 x 4 x 16'-0"	2 ea	Side Wall Header
2 x 4 x 15'-6"	2 ea	Side Wall Header
J - 2 x 6 x 16'-0"	2 ea	Top Plate
2 x 6 x 7'-9"	4 ea	Top Plate
K - 2 x 4 x 6'-0 3/4"	4 ea	End Wall Sill
L - 2 x 4 x 6'-2"	4 ea	Door Stud
M - 2 x 4 x 0'-9 1/2"	4 ea	Nailing Block
N - 2 x 4 x 6'-0 3/4"	4 ea	End Wall Header
P - 2 x 4 x 5'-1 1/2"	8 ea	End Wall Stud
Q - 2 x 4 x 2'-9"	2 ea	Door Header
R - 2 x 4 x 5'-11 3/4"	4 ea	Diagonal Rafter
S - 2 x 4 x 16'-0"	1 ea	Ridge Board
T - 2 x 4 x 8'-11 3/8"	10 ea	Common Rafter
U - 2 x 4 x 2'-0"	5 ea	Collar Tie
V - 2 x 4 x 11'-9 1/2"	4 ea	Hip Rafter *2
W - 2 x 4 x 2'-9"	2 ea	Hip Brace
X - 2 x 4 x 6'-11 3/4"	4 ea	End Rafter
Y - 2 x 4 x 4'-4"	4 ea	Jack Rafter *2
Z - 1/2" x 2'-0" x 8'-0"	4 ea	Side Wall Skirt
1/2" x 2'-0" x 7'-9"	4 ea	Side Wall Skirt
AA - 1/2" x 2'-0" x 6'-5 3/4"	4 ea	End Wall Skirt
#16 Mesh 4'-0" wide	100 LF	Screen *3
1/2" x 1"	300 LF	Screen Lath *3
Nail 2d	1.0 lb	For Screen Lath
Nail 8d	10.0 lb	
Nail 10d	5.0 lb	
Nail 16d	5.0 lb	
Tent Light Set	1 ea	Harvest Eagle Type
<b>NOTES:</b> *1 Trim after installation to appropriate size. *2 Compound Miters involved in installation. *3 (Not shown on plans) Staples may be used to anchor screen in place until lath can be installed.		

**Rafter pitches and cuts:**

- Common rafter pitch: 7:12
- Hip rafter pitch: 7:17 (30 degree compound cut)
- End rafter pitch: 4:12
- Jack rafter pitch: 7:12 (42.5 degree compound cut)

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**Review Questions  
for  
Tent Hardbacking**

<b>Question</b>	<b>Answer</b>
1. The first floor joist is placed how far in from the end?	a. 2' b. 1' 10 1/2" c. 2' 10 1/2 d. 1'
2. What is the spacing between floor joists?	a. 1' b. 2' c. 3' d. 4''
3. What should you use for flooring in a hardback tent?	a. Plywood b. 1'' x 6''s c. Paneling d. All the above
4. What are the walls made of?	a. 2'' x 4''s b. 2'' x 6''s c. CMU d. Brick

**NOTE:**

CerTest number 8077 is mandatory for this task. CerTest number 8077 "Specific Contingency Responsibilities – Structures" include the following diamond tasks:

- Structural shoring/bracing concepts
- Runways
- Tent Hardbacking
- B-1 Revetment

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### TENT HARDBACKING

Performance Checklist		
Step	Yes	No
1. Can the trainee state when a hardback should be used (deployment length)?		
2. Did the trainee to layout the floor?		
3. Did the trainee know layout and cut the rafters?		
4. Can the trainee explain why the hardback frame is built 6” smaller then the tent it self?		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will assure the issue is still fresh in the mind of both the trainee and trainer.

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## PERFORM EXPEDIENT FIELD CONSTRUCTION

MODULE 37

AFQTP UNIT 2

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### TEMPER TENT (37.2.2.1.)

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## TEMPER TENT

### *Task Training Guide*

<b>STS Reference Number/Title:</b>	37.2.2.1. TEMPER Tent
<b>Training References:</b>	<ul style="list-style-type: none"><li>• CD-ROM TEMPER Tent, QTP 3E3X1-37.2.2.1C</li><li>• TO 35E5-6-1</li></ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"><li>• Possess, as a minimum, a 3E331 AFSC.</li></ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"><li>• Complete TEMPER Tent Set</li><li>• Leather gloves</li></ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"><li>• The trainee should understand the basic concepts of the TEMPER Tent erection.</li></ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"><li>• The trainee, as a member of a team, will be able to erect a TEMPER Tent.</li></ul>
<b>Notes:</b>	
<ul style="list-style-type: none"><li>• Any safety violation is an automatic failure.</li></ul>	

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## TEMPER TENT

**Background.** Tent Extendible Modular Personnel (TEMPER). By far the most numerous facility in the Harvest Falcon and Harvest Eagle packages, the TEMPER tent is a modular soft shelter supported by an aluminum frame structure. The tent fabric is made of a synthetic material. Its primary use is for troop billeting (12 personnel per tent) but it also supports other functions such as shops and administrative space. The tent comes with roll up windows, mosquito netting, and a fly sheet (waterproof material that attaches above the tent top and allows free movement of air between the fly sheet and tent top). The tent comes in 8 by 20-foot sections that fasten together; the nominal tent size is 32 by 20 feet. Also included are a white inner liner for insulation within the tent and a fabric floor. For special adaptations, solid doors and entry vestibules are available. An electrical wiring kit provides lights and convenience outlets. The TEMPER tent can be heated and cooled as required and a fabric plenum is provided to direct airflow. Ten people can easily erect this shelter in less than two hours. In a basic Harvest Falcon 1,100 person/one aircraft squadron configuration, 92 tents are provided for billeting purposes and 56 support other base functions.

*To perform the task, view AFQTP 3E3X1-37.2.2.1C Version 1.0 TEMPER Tent CD-ROM*

**NOTE:**

In the CD-ROM there are tests after each section. Complete each section and answer the questions.

CerTest numbers 8070, 8071, 8072, and 8073 are mandatory for this task.

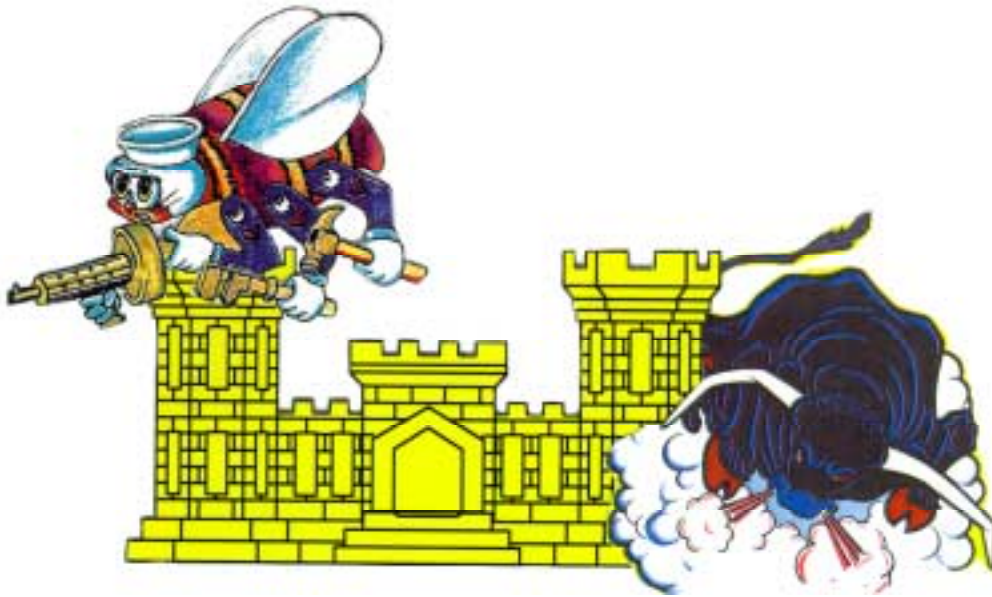
**HINT:** To increase the chances of obtaining a passing score, recommend you take each corresponding CerTest after you complete a section. Contact your UETM to schedule testing.

**Notice.** This AFQTP is NOT intended to replace the applicable technical references nor is it intended to replace hands-on training. It is to be used in conjunction with these for training purposes only.

## TEMPER TENT

Performance Checklist		
Step	Yes	No
1. Can the trainee describe the characteristics of a good site location?		
2. Can the trainee identify various parts of the set and their function?		
3. Did the trainee properly layout the arches?		
4. Did the trainee install the purlins correctly (and were gloves worn)?		
5. Can the trainee determine when to install the lights, liners, and plenums?		
6. Can the trainee explain how to properly stake down the TEMPER Tent?		

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## ASSEMBLE KIT-TYPE REVETMENTS

MODULE 37

AFQTP UNIT 5

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B-1 (37.5.1.2.)

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**B-1**

***Task Training Guide***

<b>STS Reference Number/Title:</b>	37.5.1.2. B-1
<b>Training References:</b>	<ul style="list-style-type: none"><li>• CDCs 3E351</li><li>• CD-ROM, Revetments QTP 3E2X1-26.2 and 3E3X1C-37.5 Version 1.0</li></ul>
<b>Prerequisites:</b>	<ul style="list-style-type: none"><li>• Possess as a minimum, a 3E331 AFSC</li></ul>
<b>Equipment/Tools Required:</b>	<ul style="list-style-type: none"><li>• Ball Peen hammers</li><li>• Vice grips</li><li>• Flaring tool</li><li>• Pin alignment tool</li><li>• Hearing protection</li></ul>
<b>Learning Objective:</b>	<ul style="list-style-type: none"><li>• Trainee should be able to erect a typical B-1 revetment kit</li></ul>
<b>Samples of Behavior:</b>	<ul style="list-style-type: none"><li>• Trainee should know the different types of steel revetment kits and how to erect them</li></ul>
<b>Notes:</b>	
<ul style="list-style-type: none"><li>• Any safety violation is an automatic failure.</li></ul>	

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**Background:** As Civil Engineers we are responsible for the operability of all base facilities during peacetime as well as during war. We must utilize all the physical measures available to ensure these facilities *remain* usable. Many bases, to include bare bases, do not have enough hardened facilities to protect high priority assets from bomb blast and fragments. Hardening provides a relatively inexpensive method to improve survivability and reduce the destructive effects of conventional weapon systems.

As engineers we will be called upon to build revetments to protect aircraft, POL areas, command centers, etc. Primary revetment materials that you will come across and use are soil/soil cement, concrete, timber, steel, and plastic armor. Revetments can be used to protect personnel or equipment, and be used for fighting positions. Some restrictions could hamper the type of revetment to be erected. These could include time, material availability, manpower, location, and weather. Hardening may be long-term such as reinforced concrete, or expedient such as a rapidly constructed sandbag structure.

*To perform the task, view AFQTP 3E2X1C-26.2 and 3E3X1C-37.5*    **Version 1.0**  
**REVTMENT CD-ROM**

**NOTE:**

CerTest number 8117 is mandatory for this task.

Contact your UETM to schedule testing.

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**B-1**

<b>Performance Checklist</b>		
<b>Step</b>	<b>Yes</b>	<b>No</b>
1. Can the trainee explain what revetments are used for?		
2. Can the trainee explain what size panels to use for the base course?		
3. Did the trainee explain how to flare the ends of the cross panel before assembly?		
4. Did the trainee explain what material to use to fill the B-1 revetment?		
5. Can the trainee explain why you fill the base course before adding courses on top of first course?		
6. Can the trainee explain what material to use to cap the revetment?		

**FEEDBACK:** Trainer should provide both positive and/or negative feedback to the trainee immediately after the task is performed. This will assure the issue is still fresh in the mind of both the trainee and trainer.

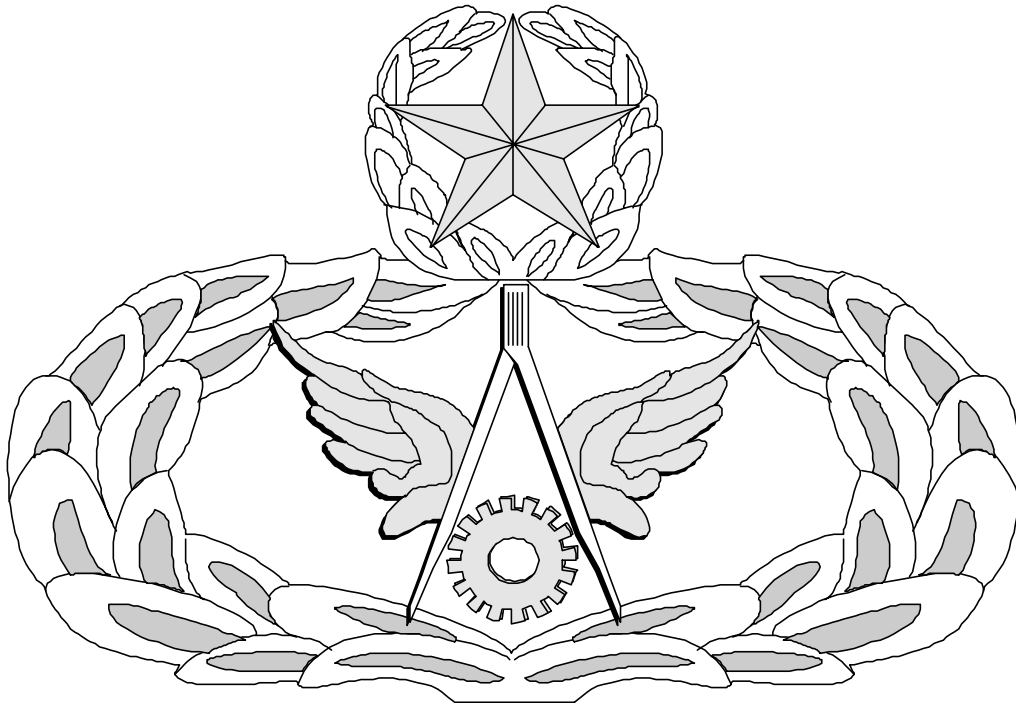
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# Air Force Civil Engineer

## QUALIFICATION TRAINING PACKAGE (QTP)

### REVIEW ANSWER KEY



for  
**STRUCTURAL**

**(3E3X1)**

**MODULE 37**

**AFSC SPECIFIC CONTINGENCY RESPONSIBILITIES**

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**Key-1**

## ROOF REPAIRS

(3E3X1-37.1.1.4.1.)

Question	Answer
1. A sheet of plywood should cover a hole from _____.	c. 3” to 3’ in diameter
2. How long should expedient repairs last?	c. Until permanent repairs can be made.
3. What is the most important step before doing any roof repair?	d. All The Above
4. You should repair a roof during a thunderstorm.	b. False

## EXTERIOR WALLS

(3E3X1-37.1.1.4.2.)

Question	Answer
1. The best material to use to repair a small diameter hole in a wall would be _____.	c. spray foam
2. What is the most important step before doing any type of repair?	d. All The Above
3. You should always do expedient repairs regardless of the amount of damage done to the building.	a. True

## STRUCTURAL SHORING AND BRACING CONCEPTS

(3E3X1-37.1.2.)

Question	Answer
1. What are beams called that are placed under or against something and are used as a support device?	b. Shoring
2. How is bracing different from shoring?	a. Bracing is permanent and shoring is temporary
3. Bracing is always a quicker repair than shoring.	b. False

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**TENT HARDBACKING**

**(3E3X1-37.2.1.)**

<b>Question</b>	<b>Answer</b>
1. The first floor joist is placed how far in from the end?	b. 1' 10 1/2"
2. What is the spacing between floor joists?	b. 2'
3. What should you use for flooring in a hardback tent?	a. Plywood
4. What are the walls made of?	a. 2" X4"s

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